# Byron Center Middle School

presents



Life's Most Valuable Resource

Interdisciplinary Unit

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Associated Underground Contractors Association

American Water Works Association, Michigan Section

presents

# Water . . . Life's Most Valuable Resource

Two Week Interdisciplinary Unit

#### **ACKNOWLEDGEMENTS**

In 1992, the Byron Center Public School district adopted "teaming and the middle school concept" as a major educational program. Through the dedication and devotion of the seventh grade team, with the cooperation and support of Principal, Dr. Thomas Jeltes, this two week interdisciplinary unit was developed. The overwhelming enthusiasm generated by the students participating in this project was the inspiration for the publication and distribution of this unit.

#### Seventh Grade Teaching Team:

Wes Boss
Esther Howse
Pat Idema
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Sue Spence
Frank VanderMoere
Tom Wiersma

Sincere gratitude is offered to the many people who donated time, information, funds, and support for this project.

Tim Burgess and Tristan VerMerris (students)

- contributed original art work used in the water unit booklet.

The Associated Underground Contractors

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The American Water Works Association, Michigan Section

- contributed many resources and materials and aided in the promotion of this unit.

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John Wierenga, City of Grand Rapids
Linda Knoblauch, Byron Township Resident
Tom Newhof, Prein and Newhof Engineering, Inc.
Larry Silvernail, Byron Township Supervisor
Justin Ward, U.S. Coast Guard

## Goals

This Interdisciplinary Unit on water was developed for many reasons. Desired results include:

- 1. To make students aware of the importance of water to life on earth.
- 2. To illustrate to students how fragile usable water is.
- 3. To acquaint the students with the importance of fresh water in daily life.
- 4. \_ To introduce students to the scientific composition/components of water.
- 5. To provide students with increased knowledge of our Great Lakes.
- 6. To engage students in cooperative work experiences.
- 7. To hold students responsible for a long term project in the areas of work performance and citizenship.
- 8. To immerse students in a unique two week learning experience about water.



## Planning

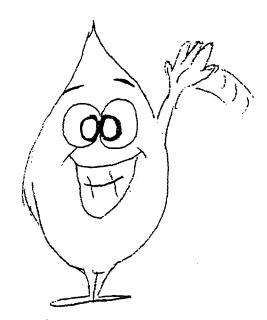
The key to success of any curriculum is to be able to adapt it to your own students needs within your own schedule, in other words, *make it yours*. Therefore we recommend that the first step you take after reviewing our manual is to determine who will be involved in teaching, how much classroom time you plan to devote to your water unit, and who will be in charge of organizing the overall unit.

Once you have these things in place, we suggest that you set up your schedule (the entire block of time) on a large poster board and place it on the wall in your planning area. Leave all class periods available as open blocks. Meet as a team and decide what activities you think you would like to include in your unit. Write each of these on individual sticky notes and place them in preliminary places on your poster. You now have an instant visual of what your plan looks like but also have the flexibility to change the sequence and/or scope of your water unit.

The following pages give you an example of what our schedule looked like after we placed all our group activities into the time slots. Each year we have to amend and alter our schedule due to availability of guest speakers, class size, and schedule changes within the building, but the overall format remains

the same. Our unit is scheduled for six sections of seventh graders. In order to identify each section, we assigned each teacher to a Great Lake. (Our sixth Great Lake was Lake St. Clair.) Each lake group was made easily identified by using a specific color folder for each lake. (Lake Michigan - blue, Lake Superior - red, etc.) This worked well as we were able to work as an entire group, divide into two groups and alternate, divide into three groups and rotate through, and keep individual classes where we all taught the same thing at the same time or each taught our individual lessons.

(The student section may be totally or partially reproduced for use in your classroom. It is suggested that each section be copied using the color of paper indicated in the student Table of Contents.)



FRIDAY				DAY		-	
THURSDAY	PRESENTATIONS GROUP A: ENGINEERING PLANT BUILDING	GROUP B: FRESH WATER TREATMENT	GROUP C: WASTE WATER TREATMENT			GROUP I: SPEAKER-COAST GUARD	GROUP II: TECH RM. REGATTA DIRECTIONS
WEDNESDAY			DOCK	DAY			
TUESDAY	GROUP I: WELL DIGGING TRIP	GROUP II: CLASS ROOMS	FISHY FACT WALL WATER DROPS		GROUP I: CLASSROOMS FISHY FACTS WALL WATER DROPS	GROUP II: WELL DIGGING TRIP	
MONDAY	INTRO WATER TASTING	MATERIALS			GROUP I: BAND ROOM MR. DERIN HISTORY/MUSIC	GROUP II: LOBBY WATER DIVINING	"HANDS ON"
WEEK	1ST 吊.	2ND HR.	3RD HR.	4TH HR.	5TH HR.	6TH HR.	TTH HR.

FRIDAY	FINAL DAY CELEBRATION	REGATTA FINALS	SAIL DEMO. STAFF				
THURSDAY	FIELD	BUS I: 2 LAKES FRESH WATER	TREATMENT PLANT BUS II: 2 LAKES	FRESH WATER BUS III: 2 LAKES	BUS IV:	- WASTE WATER - PLANT	
WEDNESDAY	•	DRY	DOCK	DAY			
TUESDAY		,	DRY				
MONDAY	GROUP A: SPEAKER- CONTRACTOR	GROUP B: SPEAKER HYDRANTS- VALVES-TOWER	GROUP C VIDEO OF WELL DIGGING		DRY	DOCK	TIME
WEEK	1ST HR.	2ND HR.	3RD HR:	HH.	5TH HR.	6TH HR.	TH HR.

### INTRODUCTION TO WATER UNIT

## First Day Activities

Class time allowed: two 45 minute class periods.

5 minutes

Announcements and attendance

10 minutes

Introductory demonstration: "And Only a Drop to Drink"

#### **Activity**

Objective: To demonstrate how limited fresh water is. Materials: 5 one gallon jugs, 2 glass jars, measuring cup

Procedure: Fill five one-gallon jugs with water. Place them at the front of the room. Imagine that this represents all the water on earth. How much of the five gallons do you

think represents fresh water? (use a measuring cup for your predictions)

Now pour 2 1/2 cups from one of the jugs into jar number 1. This represents all the fresh water in the world. From this jar measure 3/4 cup into jar number 2. What's left in jar number 1 represents all the fresh water that is inaccessible because it is frozen in polar ice caps. The water in jar number 2 represents all the fresh water available to us for drinking and all other uses. (Remind them that this includes all polluted water and also water deep below the earth's surface, some of which is not easy or economical to reach.)

15 minutes

Pass out Student Water Unit Folders and explain the basic expectations and how to use these folders. (We call them passports for they are not permitted to enter class without them. They were used as an assignment book/text book during the entire two weeks) Provide a broad description of your entire unit.

10 minutes

Do the KW(L) activity either as a group or individually. (Form is provided in white pages of student packet.)

K
What do you
KNOW about water?

W
What do you WANT
to learn about water?

What they LEARNED may be filled in as they go or at the end of the two week unit.

15 minutes

Video - Check with American Water Works Association for usage of their video on water. Worksheet (Video, Movie, Filmstrip)

35 minutes

Water tasting activity.

Results of the official survey may be recorded on the form found in each student's folder. The class results may be compiled on the board for comparison.

Description of water tasting: Teachers/parents bring five to six different sources of water to school. The water should be secretly coded so that students don't know the exact source of the water they will taste.

Students are provided with a small sample of #1. Direct students to wait until everyone is served. During this time have students observe the water sample for color and odor. Next, everyone tastes sample #1 and rates the taste qualities of sweetness, scent, bitterness, saltiness, and general appearance. After this, each student records his/her findings on top portion under water tasting form. When all samples have been sampled and form has been completed instruct them to fill in the Water Tasting Survey portion of the page in their folders.

When the activity has been completed, reveal the water sources to your students. (Sample #1 was Well Water, Sample #2 was City Water, etc.)

## Water Folklore - Finding Water

People have been intrigued with finding water for generations. "Water-Witch" is a name given to a person who attempts to locate water using any one of a variety of non-scientific methods. Willow sticks, wire clothes hangers, pliers, and hand saws are some of the devices used in attempts to locate water. Although there is not scientific proof to substantiate the methods, the fact that water has been found using these methods has some people believing they are effective. The two devices we attempt to use in our water unit are the wire clothes hanger and a hand saw.

After obtaining several wire clothes hangers, the first step is to straighten the hangers into a single wire with a right angle on one end leaving approximately four inches at the end. Using two of these wires, hold your arms at your side with your elbows bent and your hands held in front of you. Curl your fingers until the tips touch your palms. Have someone insert the four-inch part of the wire in the tunnel formed by your hands (one in each hand). Adjust your hands so that the long parts of the wires tilt slightly down. DO NOT GRIP THE WIRES! If you walk slowly in an east to west direction, you will find the wires move and tend to cross periodically. When the wires cross, try walking north or south. You should find that the wires stay crossed. This is supposed to indicate a north-south vein of water. The same phenomenon occurs on a southwest to northwest diagonal. If string is used to mark all of these veins, it gives the appearance of a grid with vertical and diagonal lines when you are facing north or south. Where a north-south line intersects with a diagonal line is where one should attempt to seek water. We give the students hangers and have them construct their wires. They are then instructed to grid an area in an open field.

The hand saw is used in an attempt to predict the depth water might be found. The saw is held by the metal end with the handle pointing away from you. The saw should rest across the fingers of both hands with the tip of the saw under the heel of both hands. Slowly move the handle over the area where the wires crossed. The saw has a tendency to bounce. Count the number of bounces. Each bounce should represent a depth of one foot.

Once a spot has been selected and the depth predicted, we drive a shallow well in an attempt to prove or disprove the practice. This makes a great hands-on activity for those who enjoy getting dirty.

If a member of your staff is not comfortable with leading this instruction, survey people in your community. You will be surprised at the number of people who actually have tried this and believe it really works.

## Field Trip Activity: Drilling the Well

#### How we did it:

- 1. Location Mr. Vander Moere's home (teacher)
- 2. Travel Students walked (about 1/2 mile)
- 3. Materials needed -

One (1) Well Point - 2" x 30"
Two ten-foot lengths of 2" well pipe
Weighted well driver (ours was about 40 pounds)
Pipe couplings
Post-hole digger
Pipe wrenches
Hand pitcher pump

- 4. After "water witching" and making a grid of the entire property area, we selected the best possible location to drive our well. The students created the grid and many tried the "water witching" (divining) procedure with some success.
- 5. We started a hole with the post-hole digger and dug to a depth of about eight feet.
- 6. We inserted the well point and one length of pipe (10") and drove the pipe with the weighted driver. Students took turns lifting and driving the pipe with the driver.
- 7. After driving the pipe the ten feet into the earth we tested for water using the hand pitcher pump, checking for volume.
- 8. We then attached the second length of pipe and continued driving until we found acceptable water.

This activity was pre-planned. A test well was driven in a close proximity to make sure that students would be able to be successful in their endeavor.

## Activities During Well Drilling

#### FISHY FACT WALL GAME

Each of our groups was assigned a Great Lake name and folders were color coded so each teacher knew what group they belonged with. (We had six groups, so we invented our sixth "Great Lake," Lake St. Clair.)

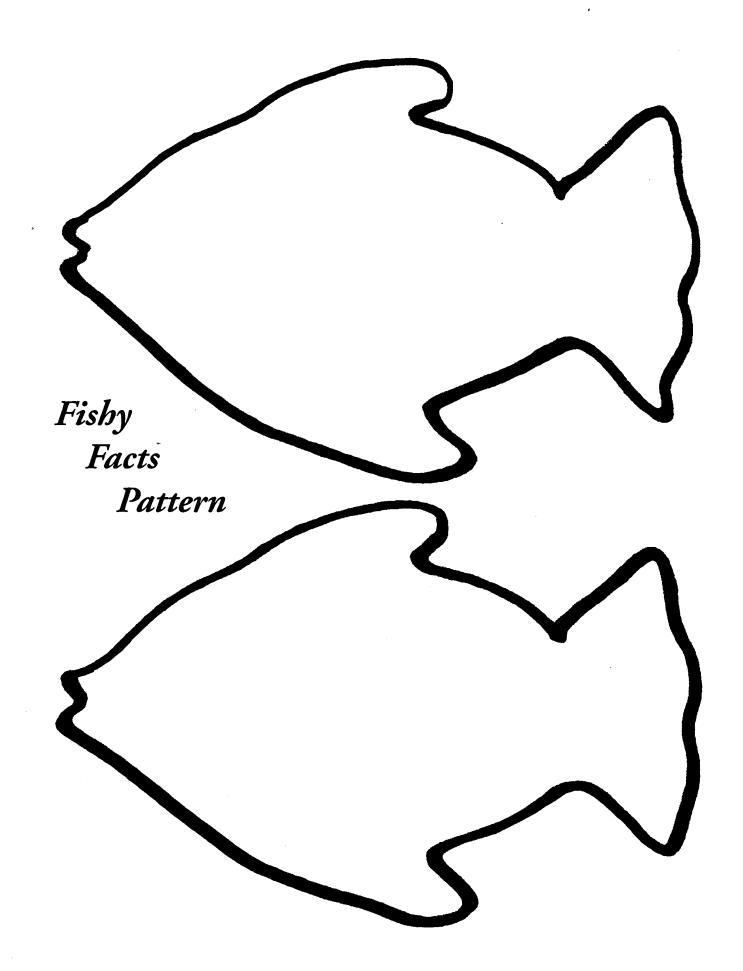
- 1. Each student must find two facts about the Great Lake they were assigned. (duplication was not allowed)
- 2. This fact should be edited, typed, and placed on a fish. (See Template)
- 3. Students must then decorate their fish. Let their imaginations be their bounds. We had contests for the best dressed, most imaginative and most realistic fish.
- 4. Each student must do a minimum of two fish.
- 5. The teacher then "tags" the fish with numbers for easy identification and allows students to place their fish in the correct lake in the hallway. After school each teacher decorates two "fishy fish" and places incorrect information about the lake on them.
- 6. The students must then try to identify all the fake or "fishy facts", and record the number of the fish in their folders. Prizes were given for those who found all the fake facts.

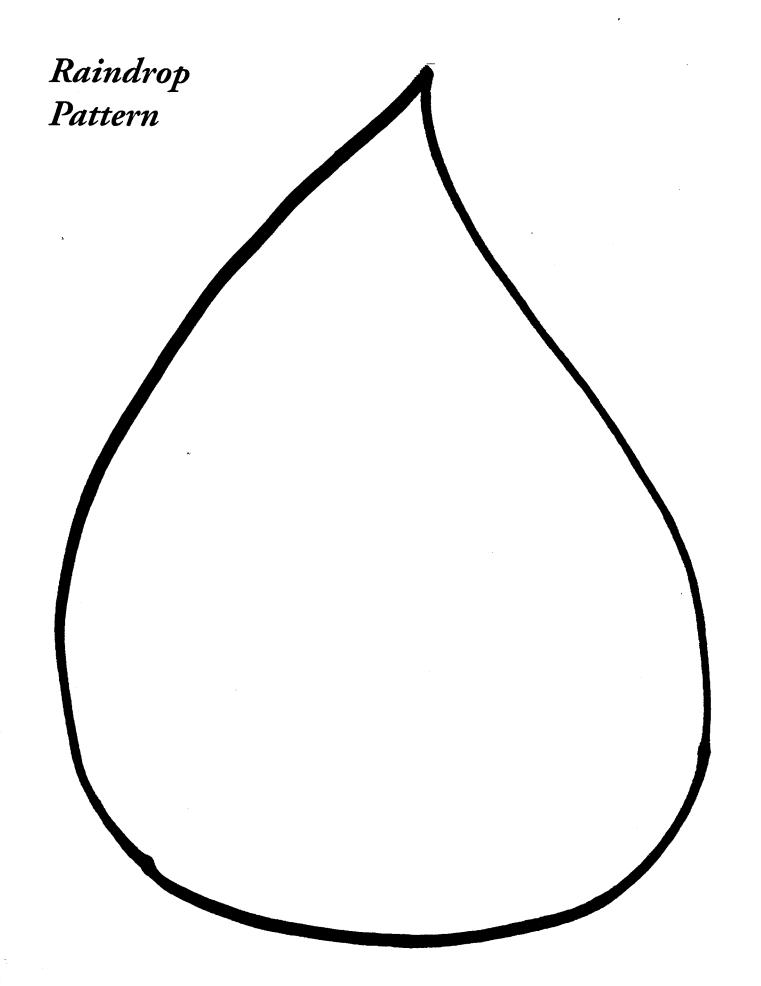
(Using an overhead projector, we had two students from each lake group "project" their lake onto a large piece of blue paper on the wall. They then traced their lake, took it down, cut it out, and placed it on a large wall in the hallway. When all the lakes were assembled as foreground, the state of Michigan was formed as background.)

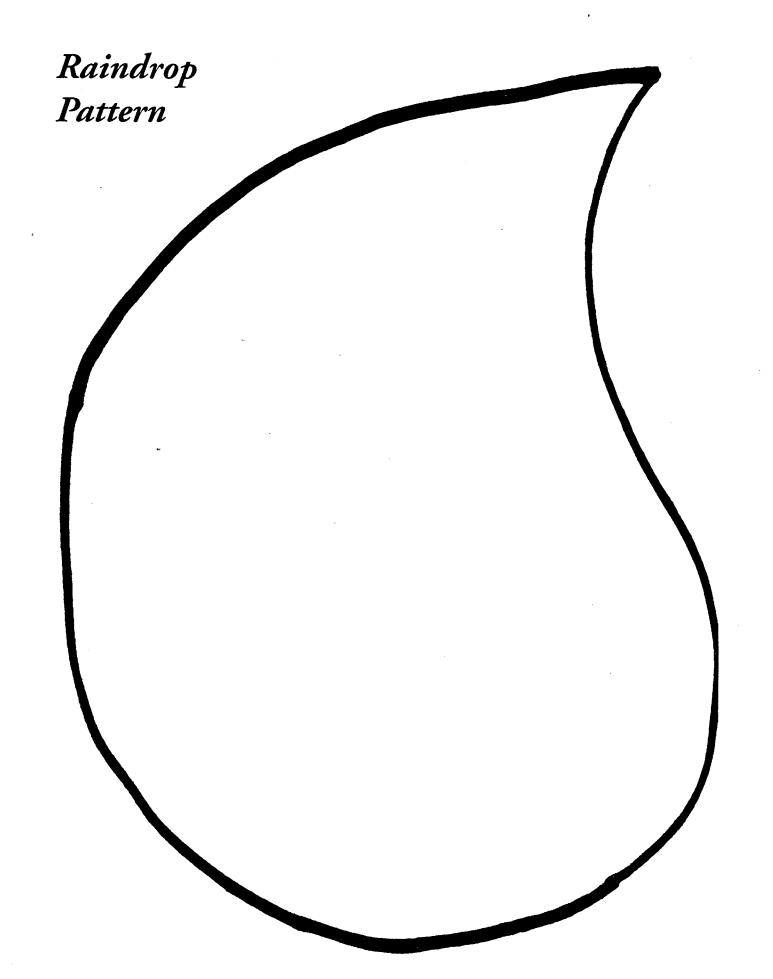
#### CREATING A RAINFALL IN YOUR CLASSROOM

From several sources provided, students produce neatly written or typed expressions or quotations about water. These could be common phrases such as "I'm in hot water now," or "That's water under the bridge." Or perhaps verses to particular songs such as "The Itsy Bitsy Spider" could be written. In addition, the use of books such as <u>Bartlett's Book of Quotations</u> could produce water quotes.

After peer editing and proofreading, glue one expression/quote to each raindrop. (see template) Tie yarn or string through a hole in the top of the drop. The teacher can then suspend the drops from the ceiling creating a great visual effect for each classroom.







## **Guest Speakers**

We obtained our guest speakers through personal contacts. A simple phone call in most cases was all that was needed. If they did not feel comfortable speaking in front of a group of students this age, they usually referred us to another source. Most people were more than happy to help. If you do not know any resources in your area contact *The American Water Works Association*. They have a list of contact people in 80 counties in the state of Michigan. They may also have information, equipment, and/or videos that they can provide for you.

Our guest speakers included:

Engineer

Tom Newhof - Prein & Newhof

Chemist

Terry Frantic - G.R. Water Treatment

Ensign

Justin Ward - U.S. Coast Guard

Construction

Jim Dykema - Dykema, Inc.

Sailing

Sue Cline - Teacher

Linda Knoblach - Board Member

Waste Treatment

Pat Idema - Teacher

(you can contact County Health Dept. for speaker)

Water Distribution

Wess Boss - Teacher

Supplies (East Jordan Iron Works

(see inf. on next page)

On the initial day of the unit, consider bringing in an outside performer for a total group presentation to peak students' interest in the unit. One suggestion is Mr. Michael Deren of Ann Arbor, Michigan. He has put on a one man show portraying a Great Lakes schooner captain incorporating audience participation with history, music, water facts, conservation, and more.

## Water Delivery

### 42 Minute Time Period

This session follows the path of water from various types of storage facilities to the actual places of use.

Photographs of existing water storage tanks are made available for students viewing and discussion of the internal operation of each type follows. Also included in this discussion is where the water comes from, volume of the tank, how often it must be refilled, and the strategic placement of the various tanks.

Blueprints of existing and projected water lines are shown and discussed. Water-loops with valves to facilitate them are emphasized to show a back-up plan for continued water supply in the event of a water line problem. Charts showing the different size lines indicating the volume of water able to pass through them under various pressures are also identified and discussed.

Actual working cut-away versions of the line valves and fire hydrants are shown and operated to show students the function of each. Permission was obtained from our local government to actually open a pressurized hydrant to show the actual pressure involved and the danger connected with hydrants.

Photographs and blue-prints are available from local city and township offices, as well as local water department officials. The cut-away valve and hydrant were made available through East Jordan Iron Works, Inc.

This presentation is done by one of our teachers. If a person on staff does not feel comfortable doing this, contact your local city or township officials for help. They may be able to provide a speaker or refer you to someone with the knowledge to make this presentation.

# FIELD TRIP

### Bus 3 & 4

<u>G.R. V</u>	<u>Water Treatmen</u>	t Plant:				-		
8:30	Depart - 45 m	iinute drive						
9:15	Arrive at water treatment plant - 1 hour 45 minutes for tour							
11:00	Depart - 30 minute drive to McDonald's in Standale							
11:30	Arrive McDor	nald's - 30 minutes for	lunch		•			
12:00	Depart - 15 m	inute drive						
12:15	Arrive G.R. W	Vaste Water Treatment	Plant - 1 1/2 hour	tour				
1:45								
2:10	Arrive at middle school - report to Lake Groups							
Bus 1	& 2							
<u>G.R. V</u>	Wastewater Trea	tment Plant:						
8:30	Depart - 30 m	iinute drive						
9:00	Arrive at wastewater plant - 1 1/2 hour tour							
10:30	Depart - 30 minute drive to McDonald's in Standale							
11:00	Arrive McDonald's - 30 minutes for lunch							
11:30	Depart - 30 minute drive							
12:00	O Arrive water treatment plant - 1 hour 45 minute tour							
1:45	•							
2:10	Arrive at mide	lle school - report to I	ake Groups					
		FIELD T	RIP CHAPE	RON	IES			
						•		
Bus #1	Mrs. Flohe Mrs. Van Dellen			us #3	Mrs. Burgess Mrs. Hansen			
	Teachers:	Dr. Jeltes Mrs. DuPuis			Teachers:	Mrs. Idema Miss Leatherman		
Bus #2				us #4	Mrs. Roosien Mrs. Smith			
	Mrs. Wilkerson				Mirs. Smit.	n		
	Teachers:	Mrs. Howse			Teacher:	Mr. VanderMoere		

Mr. Patoe

### Final Day Celebration

A breakfast was planned through our cafeteria. The students were served pancakes, sausage, juice, and milk. (This tied in with the student's study of how much water was used in preparing food and other products they used.)

Following breakfast, one of our staff members gave a talk and demonstration about sails and sailing. This demonstration was given in connection with our regatta.

The finals of the regatta were held following the sails demonstration.

Students were then shown how an authorized adult can open and close a fire hydrant. This illustrated the water pressure involved in forcing the water through a system. A discussion of safety procedures related to fire hydrants also occurred.

Students returned to the classroom where they were provided time to add final touches to their water booklets.

Booklets were turned in to their Lake teachers.

In the afternoon, a water related movie was shown.

### **Final Evaluation**

The students are required to bring their water folders to all classes throughout the two week unit. Dry Dock Days only mean that students follow their regular classroom schedule, but teachers use pages and activities found in their booklet on those days. They are required to fill in the forms for the correct activity (guest speakers, videos, movies, field trips, etc.) This is required even for our own teachers when they are acting as a speaker.

The students are asked to take notes at the time and then are given an opportunity to rewrite any of the forms. If you use these forms, duplicate more than the required number as they may be needed.

A sample of the Rubric we use for evaluating each student is given on the following page. The grading was done by lake group teacher and then the grade was shared with all teachers and applied to <u>all</u> subjects. We used this grade as a test grade in every class as it represented two weeks of work completed by that student.

Following the rubric you will find a sample of our parental permission form. We had to have these signed in order to go on the field trips. Students had a deadline by which they had to have these returned and were rewarded by points on their rubric.

Several other pages of information, activities, and answer keys have also been included for your convenience. If no additional information was given, it was because we felt that the students' explanations were adequate.